SURVEILLANCE SYSTEM FOR FOREST FIRES

Software Requirements Specification - 2.0

27 Apr,2019

GROUP O

Arjit Arora
Ankit Gehlot
Saurav Tayal
Nitesh Ahirwar
Akshit Khatgarh

Prepared for
CS 258 Software Engineering
Spring 2019

Revision History

Date	Description	Author	Comments
24 Jan 2019	Version 1.0	Group O	-
27 Apr 2019	Version 2.0	Group O	-

Table of Contents

1. INTRODUCTION **4**
1.1 Purpose 4
1.2 Scope 4
1.3 Definitions, Acronyms, and Abbreviations 5
1.4 References 5
1.5 Overview 5
2. GENERAL DESCRIPTION **6**
2.1 Product Perspective 6
2.2 Product Functions 6
2.3 User Characteristics 7
2.4 General Constraints 7
2.5 Assumptions and Dependencies 7
3. SPECIFIC REQUIREMENTS **8**
3.1 External Interface Requirements 8
3.1.1 User Interfaces 8
3.1.2 Hardware Interfaces 8
3.1.3 Communications Interfaces 8
3.2 Functional Requirements 9
3.3 Non-Functional Requirements 9
3.3.1 Performance 9
3.3.2 Reliability 9
3.3.3 Availability 9
3.3.4 Maintainability 10
3.5 Inverse Requirements 11
3.6 Design Constraints 12
3.7 Logical Database Requirements 13

1. Introduction

A surveillance system is required to be developed for detection of forest fires in the Melghat Tiger Reserve. The system is based on numerous IOT devices spread across the area of the forest which communicate with neighbouring IOTs to alert the security desk, in the case of a fire. For detection, the IOTs would have to be equipped with a number of sensors that will inspect the situation and inform the security situation.

1.1 Purpose

The aim of this document is to specify the complete description of the project on surveillance of forest fires. This document describes the functionalities, hardware, attributes and the constraints of the system which will be developed as part of this project. It is intended to be used by members of the project team that will implement and verify the correct functioning of the system. The client can also use this document to verify the fulfillment of his/her/their requirement.

1.2 Scope

1) The product-"Forest Fire Surveillance System" will detect the presence of a forest fire and will send the location of incident through an interconnected network of IOTs to alert the security desk.
2) The hardware system would form a network for communication with each other and the security station.It will not calculate the location in a cascading manner but will store it as a database. It will try to optimize the signal path from the IoT device to the security station
3) It will try to optimize power usage of the Iot devices by sleep and wake cycles.
4) Overtime the location-database map can be updated economically.

1.3 Definitions, Acronyms, and Abbreviations

Arduino - Arduino consists of a physical programmable circuit board (often referred to as a microcontroller) and a piece of software.

Node - A node would consist of an Arduino equipped with sensors

IoT - The Internet of Things (IoT) in the paper refers to the nodes that will be used to create a network.

MySQL : It is an open-source relational database management system.

1.4 References

IEEE Software Engineering Standards Committee, “IEEE Std. 830-1998, IEEE
Recommended Practice for Software Requirements Specifications”, October 20, 1998.

1.5 Overview

The sections of the SRS that follow contain a more detailed insight to the various aspects and characteristics of the final product.Further,it also describes the general requirements of the product.

2. General Description

2.1 Product Perspective

Surveillance systems for forest fires based on drones have been made. Image recognition systems have also been used for this purpose. Since the number of image recording devices deployed are generally low in number, there is a possibility of developing a fault that may not be detected for quite a long period of time. The idea of IOTs , thus even in case of such faults provides accurate results still.

2.2 Product Functions

1. The product will have a number of sensors to detect the conditions of the environment and predict if there is a fire.
2. IOTs will be able to communicate with other IOTs within their communication range and exchange data if and when required.
3. A sleeping mechanism to conserve and prolong the battery life of the IOTs would be established.
4.Such a network would be able to efficiently exchange information with the security station.

2.3 User Characteristics

The only users of this system would be the security personnel.Certain staff may have admin access to some of the features.

2.4 General Constraints

1. The hardware used should have flash memory < 64 KB.
2. We need to reduce the number of nodes as much as possible by optimizing the distance between the nodes.But , we also need to take into account the possibility of failure of nodes.

2.5 Assumptions and Dependencies

1. The period of time for which the system would be able to actively perform the function of sensing the fire would depend on the length of the battery life. Although , sleep and wake cycles would be used to extend the lifetime of the IOTs, the system could suffer after a certain period.
2. It is assumed that the IOT's would be able to correctly transmit the signal even in adverse weather conditions.

3. Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interfaces

Although there is no specific requirement for a user interface , we will try to deploy a basic interface that can display the data being communicated between the various IOT nodes.

3.1.2 Hardware Interfaces:

1) Arduino
2) ESP8266 Module
3) Sensors
    a) Flame Sensor
    b) Smoke Sensor
    c) Humidity and Temperature Sensor

3.1.3 Communications Interfaces:

There will be a network of IOT devices for the implementation. The communication between the various nodes will occur over WiFi.

3.2 Functional Requirements

1) The IOT nodes should be able to pick up the data read by sensors attached to the arduino.
2) The various nodes should have the ability to communicate the data correctly with other arduinos so that the collected data can be transmitted smoothly.
3) We should be able to update the map of the locations of the IOT nodes to reduce location inconsistencies.
4) The WiFi module should have sleep and wake cycles to minimize the wastage of battery life.
5) The analysis of the dataset collected by the sensors in the affected region must be efficiently processed to provide real time state of the nearby environment of the node.

3.3 Non-Functional Requirements

3.3.1 Performance:

An interface could be provided for the map of the nodes to facilitate the surveillance further.

3.3.2 Reliability:

The location calibration device should create a map more often to reduce the error might occur due to IOTs losing their original position.

3.3.3 Availability:

The system should be up and running as much as possible so that there is no problem during the fire or any other external weather interference.

3.3.4 Maintainability :

The dataset should be dynamically updated over a period of time, so that we can analyze the probability of a particular region in the forest catching fire**.**

3.5 Inverse Requirements

The system shall not provide inaccurate data for a certain period of time after calibration of the IOT map.

3.6 Design Constraints

Due to the high cost of the sensor-arduino setup, the number of devices deployed would have to be minimized which would in turn lower the accuracy.

3.7 Logical Database Requirements

Since the sensor data collected over a certain period of time would become huge,the server storage required would be quite high. This can be taken care by periodically analyzing and compressing the data.